Supporting Information

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Employing Materials Assembly to Elucidate Surface Interactions of Amino Acids with Au Nanoparticles

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(19 pages)



Figure S1: Representative TEM image of the 40K His sample used to demonstrate the method used to count and characterize the nanoparticles as independent, linear or other (non-linearly aggregated).

- 1. It shows that there are 12 nanoparticles in close proximity (< 1 nm distance apart) to each other such that 5 of them (on the right) are linear while the rest 7 of them (on the left) are non-linear (other).
- 2. Shows 3 nanoparticles in close proximity (< 1 nm distance apart) and they are linearly arranged.
- 3. Shows 3 nanoparticles in close proximity (< 1 nm distance apart) and they are nonlinearly arranged, hence "other".
- 4. Shows only 2 nanoparticles in close proximity (< 1 nm distance apart), thus they are considered as "other".
- 5. Shows non-linear aggregates, hence "other".
- 6. Shows non-linear aggregates, hence "other".
- 7. Shows nanoparticles at distances > 1 nm apart, thus they are considered as independents.

In this manner, a total of 100 particles were counted together on different TEM images to obtain the statistical data.



Figure S2. TEM analysis of the citrate-capped Au nanoparticles after a period of 6.00 h. Part (a) presents a TEM image, while part (b) displays the statistical analysis of the assembly state.



Figure S3. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Arg over the 6.00 h reaction time. For each analysis, the Arg:Au nanoparticle ratio employed was (a) 0, (b) 40K, (c) 100K, (d) 200K, (e) 400K, (f) 1000K, (g) 4000K, (h) 8000K.



Figure S4. (a) DLS analysis of the assembly of Au nanoparticles in the presence of Arg. Part (b) presents an expanded analysis of the 40K, 1000K, and 8000K samples.



Figure S5. DLS particle size distributions for the Arg-assembled materials at Arg:Au nanoparticle ratios of (a) 40K, (b) 200K, (c) 1000K, and (d) 8000K.



Figure S6. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Cys over the 6.00 h reaction time. For each analysis, the Cys:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S7. DLS particle size distributions for the Cys-assembled materials at Cys:Au nanoparticle ratios of (a) 4K, (b) 40K, (c) 100K, and (d) 2000K.



Figure S8. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of His over the 6.00 h reaction time. For each analysis, the His:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S9. TEM analysis of the materials prepared at His:Au nanoparticle ratios of (a) 4K, (b) 40K, (c) 100K, and (d) 2000K. The scale bar represents 50 nm. Part (e) presents a statistical analysis of the assembly state based upon the TEM images.



Figure S10. DLS particle size distributions for the His-assembled materials at His:Au nanoparticle ratios of (a) 4K, (b) 40K, (c) 100K, and (d) 2000K.



Figure S11. DLS analysis of 4.00 mM His in the presence of 19.4 mM citrate, which represents the reaction concentration of the two species in the 2000K His sample. As is evident, a peak is visible at \sim 100 nm, suggesting that some type of aggregated structure is generated under these conditions.



Figure S12. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Ala over the 6.00 h reaction time. For each analysis, the Ala:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S13. TEM analysis of the materials prepared at Ala:Au nanoparticle ratios of (a) 4K, (b) 40K, (c) 100K, and (d) 2000K. The scale bar represents 50 nm. Part (e) presents a statistical analysis of the assembly state based upon the TEM images.



Figure S14. DLS particle size distributions for the Ala-assembled materials at Ala:Au nanoparticle ratios of (a) 4K, (b) 40K, (c) 100K, and (d) 2000K.



Figure S15. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Cys over the 2.00 h reaction time at 10.0 °C. For each analysis, the Cys:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S16. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Cys over the 2.00 h reaction time at 40.0 °C. For each analysis, the Cys:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S17. UV-vis analysis of the citrate-capped Au nanoparticles in the presence of Cys over the 2.00 h reaction time at 70.0 °C. For each analysis, the Cys:Au nanoparticle ratio employed was (a) 0, (b) 4K, (c) 10K, (d) 40K, (e) 100K, (f) 200K, (g) 1000K, (h) 2000K.



Figure S18. TEM analysis of the effects of reaction temperature on the cysteine mediated assembly of Au nanoparticles at temperatures of (a) 10.0 °C, (b) 40.0 °C, and (c) 70.0 °C at Cys:Au nanoparticle ratios of 4K, 40K, 100K, and 2000K. The graph on the right demonstrates a statistical analysis of the nanoparticle assembly state as determined from the TEM study of >100 nanoparticles.